DEPARTMENT OF COMMERCE

BUREAU OF MINES

FALLS OF ROOF AND COAL

GENERALIZED REPORT ON MINES OF THE UNION PACIFIC COAL COMPANY

- in the -

ROCK SPRINGS AND SUPERIOR DISTRICTS, WYOMING

- By -

J. W. Paul and H. Tomlinson

March, 1930

INDEX

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J. W. PAUL and H. TOMLINSON.

INTRODUCTION

This is a confidential report on the mines in the Rock Springs and Superior districts, Wyoming, operated by the Union Pacific Coal Company and is the result of a study made during January, 1930, in the underground operations relating to roof hazards and roof support.

The several mines are discussed under the captions of, 1. Mining method as it affects roof action and roof falls; 2. Timbering practice as it affects safety; 3. Roof testing as it indicates unusual or unsafe roof; 4. Supervision as it affects efficiency in operation and safety; 5. Safety organization; 6. Supervision as it relates to roof hazards; and 7. Conclusions and acknowledgments.

The substance of the several captions of this report were discussed with Mr. Eugene McAuliffe, President, Mr. George B. Pryde, Vice President and General Manager, and Mr. I. N. Bayless, Assistant General Manager; and, at the conclusion of the study, a memorandum giving a summary of our observations was furnished Mr. McAuliffe.

1.- MINING METHOD AS IT AFFECTS ROOF ACTION AND ROOF FALLS.

No. 4 Mine, Rock Springs.

The room and pillar method of mining is employed, slopes advancing to the dip, entries on the strike, and rooms advancing on the face slips, which run about 45° off the strike, rooms being turned and advanced as the entry advances. Room pillars are withdrawn or robbed when the rooms have advanced the required distance. At times blocks of room pillars are being withdrawn on the same entry, 1,000 to 1,200 feet apart, with rooms still advancing in between. This practice will tend to throw undue pressure on the advancing room haulage entry. No definite pillar lines are maintained, and excessively wide areas are always present.

Entry stumps and chain pillars:

No regular break lines are established, the immediate supervisor of this work being a timberman or shot-firer under the direction of the mine foreman, who directs the operation of withdrawing the pillars to the best of his ability as the situation arises. No preconceived plan, or method of attack, is laid out by the Engineering Department. Through lack of method, valuable coal is lost, and excessively wide areas are produced, which are favorable to accidents from falls of roof and coal. By adopting a plan or mining method laid out by the engineering staff suited to the prevailing conditions, a greatly increased recovery of coal would result. A systematic method of roof support may be adopted, and hazards that may result from falls in many cases may be reduced.

No. 8 Mine, Rock Springs

The long face method of mining is employed. Rooms or gateways 100 feet apart are advanced up the pitch from the caving entry, of the strike entries, to the caving entry of the strike entry above, a distance of approximately 300 feet. A long face is then made by taking a series of slabs up and down the pitch and advancing on the strike to the next gateway or room, often leaving a small pillar varying from 6 to 30 feet before the next gateway is reached. These long faces are advanced as the entry advances. It is often the practice to work one long face inbye and the adjoining long face outbye. This practice creates a serious roof hazard, and is conducive to so-called "bumps", and the falling of apparently sound roof. While this practice may appear economical, through eliminating the necessity of moving a hoist or other equipment, the money saved from not having to move the hoist may be paid out 10 times through the occurrence of a fatal accident.

The majority of these long faces are worked by scraper. However, one place was observed which was being worked by a Duck-Bill and Shaker Conveyor. While a Duck Bill allows closer roof support, this advantage is completely lost due to the fact that it takes from 2 to 3 days to clean up a face. The result is that the bad roof condition caused by slow operation is always moving up with the working face, and creates at times a very dangerous condition, due to men working under bad roof, which is very difficult to support.

If Duck Bill and Shaker Conveyors are to be used in long faces, the long face should be cut down in length, that it may be cleaned up in one shift, and a continuous movement made. It is believed by the

writers that by following out this practice in cutting down the size of the face, that dangerous roof conditions would be altogether eliminated in these faces, due to the fact that closer roof protection can be given to the men working on the conveyors.

A systematic advance plan, either inbye or outbye, would to a large degree prevent sudden outbursts of roof that may result in a fatality. It is not reasonable to believe that it is sound practice to advance a face inbye 70 or 80 feet from a gateway, then to skip one gateway and start a long face, advancing outbye, depending on the pillar in the center to hold the roof intact with the aid of posting. Roof movement brought about by mining conditions of this kind not only has its affect on the immediate working face, but also has its effect on the entries above and below through the prevention of a complete cave or settlement of the roof measures by a small pillar. The life of the mine may be greatly endangered by practices of this kind.

Entry stumps and chain pillars:

No regular break lines are established in this mine. The work is performed by men loading into a northern conveyor, often two machines working 10 or 15 feet apart, which creates so much noise that it is practically impossible to hear any warning of roof movement that may be given off.

Men loading onto these northern conveyors are in a number of cases dependent upon a timberman or a foreman to test the roof and to place whatever posts may be necessary for their safety. Each unit should be provided with tools necessary to place a temporary post when required, thus allowing these men to depend partially on themselves for

their safety rather than on a supervisor or a timberman, all the time.

No. 1 Reliance Mine

The room and pillar panel method of mining is here employed, panel slopes being advanced down the dip, and rooms25 to 30 feet wide being advanced on the strike on 50 to 60 feet centers. When the rooms have been advanced their required distance, the pillar is withdrawn.

In No. 2 Panel off 8 North, true pillar robbing is being exercised, at the cost of much loss of coal and some track and ties. Practical mining methods at this panel should have produced 50% more coal, but the roof hazard created by the system used makes the recovery of the remaining coal impracticable. Rooms in some instances were found 40 to 50 feet wide, head coal standing and ribs slabbed in spots. While there is no remedy for the present condition of this panel, the poor recovery in it should prompt future panels to be developed on a definite plan that would assure greater recovery under safer roof conditions. Such a plan would involve the driving on sights with a pre-determined room and pillar width and systematic removal of the pillars by the pocket and stump, or, as it is often called, the pocket and curtain. Such a method would save the loss of coal which now takes place on the low side of many rooms, in some cases 3 to 4 feet in thickness. While the plan suggested is in the interest of economy and extending the life of the mine, it would also add to its safety, as related to roof hazards.

The plan which was proposed by one of the assistant foremen to remove these pillars, as outlined in a previous report on this mine, has not been carried out. In fact, it appears that no plan or system

has been followed, excepting to skip the pillar, get whatever easy coal may be in reach, and abandon the place. Removing pillars this way has involved the loss of valuable coal and increases the roof hazards, so that a miner, no matter how careful or experienced he may be, is allowed to run the risk of being injured through such an unsystematic and antiquated method of mining.

Observations made in No. 7 Panel, rise side, were similar to those in No. 2 Panel. On visiting the working places in these sections, we found that miners were in a number of instances under bad top, and at our suggestion, either took it down or placed timber under it. In such cases, it can only be inferred that these miners do not often test their roof or do not know how to test the roof.

In 5 North, where 8 men were engaged in withdrawing entry stumps and room panels, the men were found to use a wooden tamping bar for testing the roof, which is 10 to 15 feet high after the head coal is taken down. In one instance the tamping bar was found to be split at each end, and was useless in testing, since the vibrations that were set up were absorbed in energizing the rods that were split, and gave out a buzzing sound. Skipping was the practice in entry pillar work, and excessively wide areas were the result.

No. 3 Mine, Winton

The mining method now employed is the long face method. It was observed on the 5th South, where a long scraper face had been finished, and the roof had caved, that the caving of the roof had extended over the line of cribs, and the caving entry was partially blocked by roof material. While this condition may have little effect on ventilation, the width of this caving entry might have been driven narrower with advantage. The overriding of these cribs may materially affect the haulage entry in the near future, and be a cause of constant expense for upkeep and a constant roof hazard. It will seriously affect the recovery of the entry chain pillar, which appears too narrow for final recovery.

Some experiments are being carried on with the roof action at this mine, which seems to be favorable to causing a serious roof hazard in the future life of the mine. Often two long faces are worked out, leaving a pillar 25 to 30 feet between them, and a third face started before a roof break is made in the other two faces, or before an attempt is made to make a roof break in the other two places, by removing the posts. It is the opinion of the writers that when a long face has been worked out, that the posts should be immediately removed and a roof break made before the adjoining face has advanced more than 25 to 30 feet. After the roof break has occurred, this would allow the small pillar that is left between long faces to be so weakened that a gradual subsidence of the roof would take place, rather than carrying the weight over to the adjoining working face.

While Winton No. 3 Mine may have exceptionally good roof conditions, the fact must not be lost sight of that it is near the outcrop and under comparatively light cover, and if the roof is not allowed to subside completely or break down, the weight will have a tendency to follow down the pitch and create roof hazards in future work that will not only be dangerous but also expensive, and may have a serious bearing on the future life of the mine.

At the face of 6th South, Duck Bill place, the roof had changed to a rather soft unconsolidated sandy shale which required cross bars for support. The entry was 16 feet wide, and while this condition may cover a small area only, it may be general. Presumably, as the mine goes deeper, water will be in evidence, and the roof may require close timbering and cross bars. With this condition being present, it is necessary and good practice to make a series of clean breaks in the higher workings by removing all pillars between long faces, chain and entry pillars, that a squeeze may not go down the pitch and seriously impair the safety of future workings.

The development on the South side of this mine, employing scraper and shaker conveyor loaders, has the appearance of experimental work to determine if it is practicable to use mechanical loading, and at the same time control the roof. The possibility of roof control with safety against falls has not been given full trial, since there has been no attempt to establish a breakline, resulting in the loss of pillars, and in the case of the 4th South it is improbable that the entry chain pillars will ever be recovered.

The leaving of chain entry pillars between two worked out areas brings about roof action that adds to the hazard in roof falls, and necessitates extra timbering and a loss of pillar coal. The plan involving the removal of the entry chain pillars along with a retreat system for the long faces would enable the creation of a break line that would be an advantage in coal recovery and economy in operation, and give protection against bumps which dislodge roof material in working places. As this mine gets under heavy cover, the importance of forecasting the development work will become apparent.

C Mine, Superior

The room and pillar method of mining is being employed. Two parallel rooms 20 to 22 feet wide are driven up the pitch about 60 feet apart, the Duck Bill and Shaker Conveyor being used in this work. When they have advanced the required distance of about 300 feet, the pillar is immediately withdrawn on an angle of about 45° with the direction of the room, this making a face about 70 feet long. This work is double shifted, and a complete cut is cleaned up each shift, which allows a very rapid recovery of the pillar. The method employed in recovering these pillars is, in the opinion of the writers, the most practical and economical observed in any of the Union Pacific Coal Company's mines. It would be worthy of trial to attempt to remove the entry stumps and chain pillars of the 12th South by allowing the entry stump and chain pillar to be recovered by extend-

ing the rooms through from the 13th South and thus taking the coal down on that entry, thereby eliminating the necessity of allowing chain and entry pillars to lag behind some 300 to 700 feet. In the future development of this mine, it is assumed that mechanical loading will be the practice, and since this bed is under a thick overburden, some consideration should be given to the plan of the development for roof control, and maximum extraction.

To simplify the working of the mine, it would seem that the present system of retreating would offer the best solution, but in this system a regularly established break line is of great importance, and room entry chain pillars should not be permitted to remain between two worked out areas.

2. - TIMBERING PRACTICE AS IT AFFECTS SAFETY.

No. 4 Mine, Rock Springs.

Entries:

It is rarely necessary to use timber for entry support, except where pillars have been removed as the entries advanced. Then it is often necessary to place roof support at irregular intervals, brought about by roof movement due to the removal of the pillars. This support is applied where it is deemed necessary by the supervising officials, and no dangerous roof conditions were observed, here on the entries.

Rooms:

In rooms a systematic method of posting is being enforced by

the safety boss, who realizes the importance of some standard practice. This method is well suited to the mining conditions and is giving results. Good sized cap pieces are placed in a majority of cases at right angles to the slip planes.

Pillars:

No regular method of posting is employed. The miner places the posts where he or the supervisor thinks they will give the best results. This being the case, wide areas are found without any support, and constant hazards from falls are present.

No. 8 Mine, Rock Springs

Entries:

Timber for roof support on entries is placed where a dangerous condition is observed by the supervising officials. Cases were observed where top coal had sprung from the roof, and the immediate roof above the top coal was loose and without support. A careful inspection should be made at regular intervals for dangerous roof on all entries, or all excavations, as required by the State Mining Law.

Long Faces:

In long faces a systematic method of posting is employed, but due to roof movement brought about by unsound mining practice, this posting method often does not give the required protection. In many cases it was observed that one or more posts were placed under a railroad tie used as a cap piece, which gives good but not sufficient protection in all cases.

In order to give protection to the workmen in all long faces, 20 pound rails or 3 inch H beam may be used for the protection of the immediate face, placed on 4 or 5 foot centers in the form of a cantilever, and used as temporary sets. These steel members may be moved forward each cut when the permanent posts are placed in position, thus avoiding the necessity of leaving them back in the gob where the coal has been mined out.

Pillars:

In areas where the chain pillars have been removed, no definite posting method is employed. Posts are placed where a timberman or a supervisor believes they will be of most value.

It is realized by the writers that it is very difficult to outline a systematic method of posting or roof support in any pillaring work where no definite method of mining is employed.

No. 1 Mine, Reliance

Entries:

It is rarely necessary to use timber for roof support in entries, due to the fact that top coal is left in all advanced places.

Rooms:

In rooms a more or less uniform method of posting is employed, the miner timbering his room according to his individual taste, subject to the approval of the supervising officials.

Pillars:

In pillar workings no systematic method of posting is employed. The miner places the post where he or the supervising official thinks

they are necessary. Due to infrequent visits of the supervising officials, workmen were frequently observed working under dangerous roof. In such cases it can only be inferred that these miners do not often test or know how to test the roof. Here is a need for a campaign of instruction in roof protection methods. Some of the men in these sections stated that they had not been visited that day by mine boss or inspector, though it was 10:30 in one case and 11:00 o'clock in another. There is no definite plan for pillar recovery and there is no definite system of placing timber. The miners are free lances until the boss appears and gives instructions to place a prop here and a prop there, move the tract, or take a slab along here. Where such practices are followed there is no system and without system roof hazards are augmented.

Winton Mine No. 3

Entries:

Due to a splendid roof condition at this mine, timber for roof support is rarely necessary in entries.

Long faces and rooms:

A fairly uniform method of posting is employed in all long faces and rooms, which seems to be giving the desired results.

C Mine Superior

Entries and Slopes:

Dangerous roof is protected on entries and slopes by the 3 stick method of timbering, and lagging where required. In some places along the entries, top coal is left for roof support. No. dangerous roof was observed in any of the entries of this mine.

Rooms:

A good method of room timbering was observed at this mine. The Shaker Conveyor was employed in the removal of a long face on the room pillar. As the room advanced twenty foot lengths of cross bar were placed about 5 to 6 feet apart, supported by 5 to 6 props, and above the cross bars laggings were placed 3 to 4 feet apart. It was noticed that the lagging was supporting roof material which had become detached from the immediate roof and thus had prevented the material from falling and adding to the roof hazard. A singular feature of this roof is that when the rooms have been driven the required distance and the room pillar is being recovered, it is only necessary to place straight posts. This condition exists, according to the supervising officials, until the pillar is entirely removed.

3.- ROOF TESTING AS IT INDICATES UNSOUND OR UNSAFE ROOF.

Roof testing as employed at these mines is superficial. The sound method only is generally used, then often covering only a limited area from the face. Supervising officials in many instances carry a cane for testing roof and often do test for their own satisfaction, but they are only in the working face for a few minutes, while the miner is there 8 hours.

It should be the duty of each supervising official to order the miner to test the roof covering the area which he is exposed to, and then the supervising official should test for his own satisfaction.

The vibration method, which involves placing the bare hand on the roof, while testing with a tool in the other, should be employed at all times by miners and supervisors.

At No. 4 Mine, Rock Springs, men were observed working under dangerous loose top coal less than 10 minutes after a supervising official had examined the working place.

At No. 8 Mine, Rock Springs, men were observed testing roof by the sound method only while the shaker conveyor was in operation. The noise is so great when the shaker conveyor is in operation that it is difficult to hear, tending to show that roof testing is superficial.

At Reliance No. 1 Mine the roof is often 10 to 15 feet above the floor; roof testing is performed by prodding the roof with a wooden tamping stick which is often split, and the results of the test appear at the best to be a guess. By using the method as employed at Reliance it is impossible for the writers to make what would be considered by them a fair test of the condition of the roof.

Two pieces of pipe or steel bar should be in each working place, that may be used to test the condition of the roof employing the vibration method of roof testing.

4.- SUPERVISION AS IT AFFECTS EFFICIENCY IN OPERATION AND SAFETY.

There is an abundance of supervision pertaining to production, and no organization or division of territory within the supervisory force for safety of operation or the prevention of accidents.

The supervisors appear to be capable and industrious, trying to cover territories entirely too large to supervise, the result appearing to be that one supervisory is racing the other around the working places.

Data furnished by the President of the company show that in the various activities of these mines there is an unusual number of supervisors; as an illustration, at Rock Springs there is one supervisor for each 14.4 workers; at Reliance one for each 13.9; at Winton one for each 12.1; and at Superior, one for each 15.2.

This intensive supervision, however, appears to be directed toward tonnage requirements and little devoted to execution of mining plans, roof control and roof hazards.

At various mines there are a mine-foreman, an assistant mine-foreman, a driver-boss, and a safety boss, forming the supervising force. These men all attempt to visit each working place in the mine each day, which

they often do, with the result that the working places have had 4 visits during the shift, but in the 4 visits there was no time to properly supervise or instruct the miner in the proper methods to efficiently carry on his work safely.

Each mine should be divided into districts with an assistant foreman placed in charge, who would be responsible for all operations and the safety of employes. The districts should be so arranged that it would be possible for the assistant foreman to visit each working place at least every two hours during the shift, and be able to instruct the workmen in the proper methods of performing their duties safely.

The attitude of the workmen and the bosses:

So much time and money have been spent in the advocacy of safety, the adoption of standards relating to machinery and electrical apparatus, track clearance, rock dusting, ventilation and the establishing of good homes and promoting civic pride, that in practically all cases questioned the workmen and bosses alike really believe that everything possible is being done for their safety, and in a few cases employes are of the opinion that so many accidents must happen irrespective of what precautions or measures are taken to prevent them. To the man employed whose activities are confined to a small area, this is a natural reasoning and can readily be understood.

5.- SAFETY ORGANIZATION

Within the Union Pacific Coal Company's organization there is no safety organization devoting its time or efforts to prevent accidents from falls of roof and coal.

Much time is spent making inquiries and investigations when an accident occurs, but on reading over the transcripts of the inquiries on fatal accidents occurring during the year 1929, very few real points are brought out which would prevent a recurrence of an accident under similar prevailing conditions.

This leads to one of two conclusions: (a) That the inquiry is conducted to justify the accident, without any attempt being made to adopt rules or practices to prevent a recurrence, or (b) The men who conduct the inquiry are lacking either in ability, or integrity to conduct an inquiry.

It is difficult to realize that a group of competent mining men would hear evidence on how 12 fatal accidents occurred, without going on record with an opinion in writing on what they believe may be done to prevent a recurrence under similar conditions.

6.- SUPERVISION AS IT RELATES TO ROOF HAZARDS.

In any scheme of supervision for mine safety as it relates to the roof there are involved other items which must fit into the organization, since the safety organization must have a head or director who has to do with all matters involving safety.

In the first place, a list of hazards must be set out and upon which the safety director must give his concentrated attention through a system of inspection, personal observation for strict compliance, and to suggest changes in a system or practice which will increase safety.

A safety organization must adopt a system or a scheme which will always show where there has been any laxity in carrying out a safety program that has been adopted, and this can be made of value only in so far as it is made a matter of record. The mere employment of a safety engineer often results in the shifting of the responsibilities of other officials onto the safety engineer as though they were not a link in the chain for promoting safety. Safety engineers who permit such action and who function only in conducting post mortems will never render efficient service in the matter of promoting safety.

In the matter of safeguarding the mine roof:

1. The plans for development and retreat work should be given the approval of the safety engineer, and this involves the method of roof support in detail.

2. The underground officials who believe in systematic roof support should be called into conference in outlining the system of timbering

best adaptable to their mine under its various roof conditions.

3. A systematic method of roof testing should be taught all underground foremen who in turn should teach all other underground men.

4. Testing roof should be made a part of the miner's duty and he should be required always to test his roof upon having a visitor, such as an official, driver, or other person, in his working place.

5. The official upon visiting a working place should note if the miner complies with the roof testing requirement and should then proceed also to test the roof.

6. a. In some mines it is the practice to place a board, suspended from a prop, on which each visiting official places his initials and time of day. This is of value only in checking up on these officials by the foreman or safety inspector and in case of an accident to learn the interval of time elapsing between the time of the visit and the occurrence of the accident.

b. In other mines it is the practice to suspend near the working face a heavy card-board with sufficient blanks for 7 days and each time an official visits the place he dates, initials, states time and indicates anything found improper, such as lack of timbering, failure to test roof, loose or bad roof, and, at the end of the week, these cards are collected and sent to the safety engineer, who tabulates the data and in this manner his records will show the number of visits and the manner in which the miner is complying with safety regulations.

c. In a group of mines in the east which has a good record in accident prevention, a plan is adopted of using a blue card and as an official visits a working place and finds violations of timber regulations or other safety measures, he gives the miner a part of the card, furnishes the superintendent with a part of the card, and deposits the third piece on the miner's check board at the lamp house. Before the miner is again given a lamp he must see the superintendent and account for the violation reported and can only be given a lamp upon a relief notice from the superintendent. Where a safety engineer is employed, it would be an advantage for the superintendent to pass his part of the card to the safety engineer for record. In this manner the careless and indifferent men could be determined and a course of discipline determined.

7. A time study should be made to determine how and in what manner the underground officials occupy their time in making a round of their section, and in this manner the extent of his district should be determined so as to give him opportunity to visit such working place three or four times per shift, and have ample time to examine the roof, timbering and instruct the men, where necessary.

8. A safety inspector should be employed to check the work of the foreman and his associates and his report should be made to the safety engineer, daily. His duty will be to see if all safety regulations are being carried out on the part of the underground officials and workmen.

9. The reports made to the safety engineer should be entered in a permanent record and for this purpose a clerk should be assigned

the safety engineer so the latter may have time to make regular visits to the mine as a check on the inspectors.

10. Where safety measures recommended by the safety engineer are questioned by the operating officials as involving unnecessary expense, a council of officials and the chief engineer should be called to pass upon the matter and wherein the result of the conference is opposed to the recommendations, the safety engineer should not be held responsible in the event of an accident.

11. Alteration in any plan for mining should be made a matter of record and where dirty coal is encountered, the question of its mining should be determined by the chief engineer and the general superintendent, or official in charge of the mine development. In this manner, there may be much coal saved that under past practice has been lost, with attendant roof hazards brought about by leaving pillars that interfere with roof subsidence.

12. The safety engineer should make a monthly written report to the Vice President or other official to whom the assistant general manager also reports, and a copy of this report should go to the President.

13. The safety engineer should not be under the dominance of the official in charge of operations.

7.- CONCLUSIONS.

I. Through the absence of forecasting, or definite plans in mining method, accidents are frequently occurring due to haphazard practices employed, which should be charged to the lack of engineering and planning.

Plans for development and retreat work at each mine should be made and approved by the operating and safety departments.

II. Systematic methods of roof support should be adopted for each mine or section of a mine, requiring a minimum distance between posts.

Temporary steel roof support in form of a cantilever should be used in all long faces.

III. A systematic method of roof testing should be adopted and frequently employed by all employes.

IV. The underground supervisory forces should be reorganized with assistant foreman in charge and responsible for all operations in a district which will allow each working place to be visited at intervals not greater than two hours.

V. The safety organization should be reorganized with the object in view of preventing accidents rather than investigating them after they have occurred. The safety boss in each mine or group of mines should be directly responsible and report to the safety engineer and be independent of the operating force.

ACKNOWLEDGMENTS.

The writers wish to express their appreciation of the courtesies and cooperation extended by Mr. Eugene McAuliffe, Mr. George B. Pryde, Mr. I. N. Bayless and the superintendent and mine foremen of the several mines visited and to the Chief Engineer and Safety Engineer of the company while conducting the study in these several mines.

Respectfully submitted.

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U. S. Bureau of Mines,
Pittsburgh, Pa.,
March_____, 1930.

SAFETY EXAMINATION OF MINES

BY

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EXAMINATION FOR SAFETY CONDITIONS

OF

THE UNION PACIFIC COAL COMPANY'S

SUPERIOR B, C AND E MINES

WINTON NOS. 1, 3 and 7½ MINES

HANNA NOS. 2, 4 and 6 MINES

AUG. 26th to SEPT. 15th, 1930.

BY
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INDEX

Aug. 26th to Sept. 6th, 1930

Superior Mines.

All conditions good except as noted under suggestions, and in general remarks.

Suggestions:

"E" MINE AND OUTSIDE.

Discontinue hauling timber trucks mixed in trips.

Have positive car stop and switch on empty trip track outside B mine.

Ventilators over charging racks in lamp house.

Improve conditions at portal of E manway and screen portal.

Take out all unused doors in mines.

Plan manways so as to avoid crossing haulage roads and partings.

Spring switch at top inside main parting should be lowered.

Shelter holes at all switch stands on mechanical haulage roads and in slope sinking operations. All mines.

Switch stands to be on outside of curves. All mines.

Guard rails along side of drum of main hoist.

Have board trolley guards. All mines.

Build up collar of old E hoisting shaft and also protect portal of old escapeway from floods.

Bevel upper corners of gates on new steel cars.

Try to arrange haulage operations so as to avoid "pushed trips."

Fire proof drive room of E fan.

Work is progressing in cleaning up one or two parts of E return air course. There is a rather tortuous and restricted passage for air at the approach to 4th North entry. Bottom of air course in 4th panel needs a little cleaning.

Retimber part of lower end 4th Panel Slope.

"B" MINE.

Powder distributing station near inside stable could be improved by building rooms instead of using boxes.

Pillar works in 6 A entry very ragged and requires careful attention.

Care systematic timbering required in 8th & 9th South, on account of pot heads in roof.

Encourage use of boots for machine men. All mines.

In hand or contract loading-- miners must be watched to see that they block cars properly at faces.

"C" MINE.

In "C" mine trolley guards are needed on 4th & 9th panel partings.

Along the 10th South (an intake) the seals of 6th & 7th panels to the rise had been broken in an effort to bleed the workings above so that some pillars could be pulled. Warm air with some black damp was escaping and contaminating the intake air. The quantity was small but it is not good practice. Suggest that cleaning out of old workings be done on idle days with only certified men in the mine doing it.

The pillar workings in 9th panel off main and in 11th & 12th South were dry and coal shot from solid. The pillar workings of 12th South were all on return air from lower part of mine. All other conditions good with no evidence of squeezes.

Electric heater in mine foreman's cabin should be protected.

So called "Oklahoma Caps" which are long caps with cantilever ends should be discouraged.

One blower fan found arcing badly, also an Eickhoff drive.

In 9th South some pillars were being pulled along edges. Suggest double row breaking props about 10 to 15 ft. from track.

Trolley guards on 8th South motor partings are not adequate.

The main return air course is very heavily timbered but in good condition up to within about 100 ft. of the fan shaft where the timber is very thick and air travel is almost reversed.

It might increase efficiency of fan if curves in entry were lined with galvanized iron.

To minimize danger from recurrence of floods suggest escapeways be determined which would be easiest to get out and have them very conspicuously marked so that men would be thoroughly familiar with them. Also that telephonic means of communication be increased for warning purposes. It might pay to cave the old workings under the arroys where flood broke through and then use a drag line on outside to fill up surface. Experience all through the west indicate that unrestricted sheep grazing is causing a great deal of damage. Floods are increasing and much good grazing and farm land is being ruined. The history of Superior may show that the floods there have been gradually increasing-- the erosion of the last flood indicate that the arroys has been greatly deepened during recent years. If so it would pay to give the drainage area there an opportunity to grow vegetation.

Sept. 8th - 10th.

Winton Mines.

Conditions good, except as noted below and in general remarks.

WINTON #1.

New manway to 1st South level should be permanently cross-barred and lagged and screened at portal.

Steep rock tunnel near fan should have steps and hand rail.

Brattices hung over suspended conveyor pans should be placed near middle of pan. One was found almost against the supporting chains so that two of our party were struck when going through brattice.

On slope sinking the "derailers" should be placed at least 75 ft. above face on this pitch and safety holes provided in addition.

Trolley guards should be placed above upper tracks of partings.

Tracks on levels not very good.

Too much coal and material scattered about in mine.

Suggest that sliding door in motor generator room stopping be made easier to move and that a mark and printed sign be placed on setting indicating the width of opening allowed for ventilation. As now, to get through requires considerable effort and door is apt to be left open wider than necessary, thus shorting considerable air.

#3 MINE

Trucks not first class.

The old slope has been abandoned below 4th South and the track now curves into 4th South, but the old frog and rails have not been replaced by solid curved rails.

Trolley wire in 4th South very uneven in height and poorly aligned.

Trolley guards poor and inadequate.

4th South haulage road in poor shape.

On 4th South parting a water pipe is sticking up in clearance space near telephone.

Bell wire at one parting crossed power wires and touching them without guards.

Found many troughs in rock dust barriers needing resetting and filling.

In some parts of main return air course the rock dust barriers take up considerable air space as sloughing of roof had reduced height of entry.

Some plastering on coal ribs needed in motor-generator room.

Plastering also needed in some transformer rooms.

Outside portal the back switch to outside locomotive is in poor shape.

Suggest shoes for outside locomotive run to tipple. Some brakes noticed set so tight the car wheels were locked, making a prolific source for flat wheels.

Stop blocks and derail should be used on this parting. Reliance should not be placed entirely on car brakes.

#7½ MINE.

Slope track of light rail and in poor condition, no switches and rope rider pulls both latches by hand. This is poor practice, as this is often done when trip is moving.

Tracks in rooms reflect character and workmanship of the miners-- some are good and some bad-- noticed two places where cars had derailed and were laid on their sides against rib to get them out of the way.

Water slips in roof must be watched for.

To my mind props in rooms should have tops inclined a little more up pitch.

There is an inclination not to keep timbers close enough to faces.

Main return air courses should be changed at Zero Panel overcast to avoid heavy caves.

At top of shaft in fan drift a railing and wire screen should be placed near collar of shaft across drift.

Sept. 11th - 15th.

Hanna Mines.

HANNA #6

Before sinking slope further would advise derail outside of mine and the starting of safety holes.

The screen and covering arrangement at portal of manway should be copied at all mines.

HANNA #2

Suggest small supplies of stopping material be kept near the top stoppings in 2nd Entry as these places are difficult to get supplies to quickly.

Suggest test vents be equipped with gate valves. Those that were in were found in good condition and much easier to test than plugged pipes.

Might be wise to have inspectors wear self rescuers. Since the last explosion in Utah many men have them attached to their lamp belt.

In some room pillar work on left side of slope some props seemed set a little too close to lip of top coal. However, I hesitate to criticize the handling of these pillars as I know they are being mined by men who have had years of experience with them and know their actions.

Suggest shooting in this mine be done in off shift periods.

The travelling ways in the rooms where pillars are being drawn are none too safe at the loading stations at the bottom of the rooms. It takes good foot work and balancing to get down safely.

Testing for gas in these high places is very difficult. Would suggest investigating the "Judd" gas detector which has recently been approved by the Bureau of Mines.

I don't like the safety dog arrangement on the man trip. It may be possible to accidently release them when man trip is being lowered, or they may work if engine or rope fails and the cars would be jack knifed and men would be thrown against roof or rib without any chance to drop off. Without them the men would have some chance to get off in case of rope or engine failure.

HANNA #4.

The two fans for this mine might lead to complications if one should stop. The fan at "G" Plane would probably be the one and there is no signal to warn the officials. The motor house is not fire proof. If this fan is stopped the ventilation of part of the mine will be deranged. Stoppage could be detected by men in the main air courses but I don't believe men at the faces in the high coal would notice it. I don't think that ventilation by two fans in a gassy mine as arranged at Hanna is good practice. To facilitate making changes in ventilation necessitated by stoppage of a fan would suggest doors be built at such places as necessary to permit ventilation by one fan. These doors, with instructions for their use in emergencies painted on them, to be kept fastened open, or made self closing as the case may be.

Would suggest guard fence around 2300 volt switches on 4th North partings.

Hoist at E Plane should have better ventilation.

Hoist at F Plane is too close to seal stopping.

The tracks in this mine were better than in most of other mines. The motor road in 2nd South is the best I have seen, but that part of it laid with 40 lb. rail is not so good as the 60 lb. track. The difference is quite marked.

If Joy loaders could be served with storage battery locomotives running on 30 or 40 lb. rail the operations would be safer and more efficient.

With rooms driven on the strike and full height of coal taken out, pillars must be larger if they are to be left standing.

Evidently not sufficient pillars were provided for in F Plane as squeeze had been on. For future workings suggest entire surface overlying the coal to be mined be contoured and pillars planned to suit the depth of mining.

For this system of panel in gassy mines would suggest three entry system for panels with fresh air split on each side, unless the panels can be driven to connection between levels before rooms are turned off and worked. If rope trips can be run in each entry of panels there would not be the multiplicity of switches that are found in a single entry with turnouts to both sides and the rope haulage would be safer.

Suggest new workings for these properties be planned so as to permit sealing to be done off a third entry as mentioned in "General Remarks." I found many seals in #4 mine directly on main intake entries and many of these seals were leaking CO-2 which, of course, got into the fresh air going to the working faces. It was impossible to get close enough to two or three of these seals to examine them because of this gas. The entrance to these

places were not easy to get through and fire bosses should be very careful in approaching them.

Gunniting the coal surfaces around the seals would help to tighten them and a first coat gunnited on seals would serve to fill up voids better than hand plastering.

If pillars are not pulled when rooms are finished the rooms should be cross-cutted at faces, thoroughly cleaned and then rock dusted. If a panel is to be abandoned for any length of time would suggest it be sealed after cleaning and rock dusting. There are large open areas in this mine that have much fine coal on floor and are dry and dusty, which is a menace in cases of a small explosion near by.

There is little shooting during the shift although in order to rush driving of cross-cuts on the high side of rooms shooting is done during shift. These up-raise cross-cuts, to my mind, are the most dangerous places to shoot as they are the most likely places for gas to be accumulated, while below are the dust accumulations from mechanical loading and sloughing of coal ribs. I would prefer to have all shooting done on off shift periods. If, when shooting top coal, it is necessary to charge holes with more than limit for permissible powder, it is all the more essential that men be out of the mine.

I can't see how fire bosses can make thorough examinations for gas in the high rooms if they have to climb ladders and hold their lamps so far away from them on the ends of sticks, for this reason I have suggested investigation of the "Judd" detector. This may be cumbersome but I don't see that it would be any harder to handle than climbing up and down ladders and it will detect gas more accurately than the ordinary safety lamp as used in this mine.

I noticed a blower fan placed in a cross-cut between rooms. This cross-cut was near the face of the lower room in which a Joy loader was working, and 40 to 50 ft. from the face of the upper room and the blower was placed in cross-cut to ventilate the face of the upper room until its high side cross-cut, which had been started near the face, had holed through to the room above. This, strictly speaking, is using a blower on return air. To be safe, the electrical equipment should be of permissible type.

I believe that all the face electrical equipment should be of permissible types in gassy mines.

The return air course was free from caves although at the bottom the fault made some abrupt changes. Return air courses should have larger cross-sectional areas than intakes. Usually this is found reversed.

Suggest ventilators with protected tops above reach of anyone standing on roof of powder storage magazines. Also barricades in front of double steel doors. This to discourage foolish people from trying to see what would

happen if they shot through the doors. This to apply to all mines.

Main slope and 2nd North need cleaning before rock dusting. The old wooden cars leak and make it difficult to keep entries free from fine coal.

General ventilation was good although the air seemed sluggish in rooms off F panel below 4th North. It cannot be measured in the large open spaces.

I am partial to A. C. current in gassy mines, but notice the preference all through the mines to D. C. current.

I believe the management fully realizes the danger of these mines and I found that all questions I raised have been given careful thought.

GENERAL REMARKS APPLYING MORE OR LESS TO ALL MINES

HAULING TIMBER & SUPPLIES.

When examining the surface plant at "B" mine, Superior, a locomotive came out of the mine pulling a loaded trip with two timber trucks near the end of the trip, loaded with an Eickhoff extension pan, some jack pipes and two or three lengths of pipe. Following these timber trucks was a steel mine car loaded with coal, then another empty timber truck and a coal loaded mine car.

One pipe carried by the two timber trucks was so long it hit against the rear end of a loaded wooden car on the head end and against the front of the steel mine car following. With every surge of the trip it would jam either the front or back car and had damaged the end of the wooden car to some extent.

When the locomotive was cut off and the trip was dropped by gravity to the tipple, these trucks could not "make" the slight curve and were lifted off the track, derailing the cars directly in front and behind and causing a delay of about ten minutes. The trip was stopped before any damage was done as it happened while we were standing beside it.

In some sections of the main haulage system of this mine the trips are "pushed" by the locomotive, and if this accident had happened inside the mine with a pushed trip it might have been serious.

The hauling of timber trucks between loaded cars is poor practise and especially so with pushed trips. It is best, whenever possible, to take material in and out of mines during off shift periods when not running coal and when special trips can be run at limited speeds.

Asst. Supt. Hicks informed me that they were trying to do away with hauling timber during dry shifts by putting two men on night shift whose sole duty was to take care of timber distribution.

HANDLING TRIPS ON SURFACE.

The method of handling cars on surface for "B" Mine can be improved and made safer by installing a suitable stop block for the empty trip. Empty cars are taken from the

tipple up an incline by a car haul and allowed to run by gravity to the slope mouth where they are stopped by sprags and made up in rope trips. At the time of my visit the only protection against runaway trips was a switch which the top man had to open and close. It is supposed to be kept in open position until the rope is coupled on the trip, then closed for lowering, and opened after the trip has passed over.

At the time of inspection I advised having a spring switch put in so that top man would have to close it for trip to pass over, and also to have stop blocks that would have to be released before trip came to switch. A runaway trip might catch the parting tender inside and mine, and often trips will jump the switch.

Shortly after my visit I understand a trip did get away and pile up at the bottom-- fortunately no one was injured.

LAMP HOUSE.

Some lamp houses do not have ventilators over the charging racks. Where there is so much wind ventilators may seem superfluous, but it is better practice to have them.

POWDER.

The powder and cap distributing magazines in general are well built, dry and in good condition, with no undue quantities of supplies in them. The powder car at Superior "E" mine is well built with insulated couplings and is kept permanently coupled to an empty wooden car, the other coupling of which is not insulated. I understand the powder car is handled on locomotive as well as rope trips and that ends are reversed in its passage in and out of the mine.

To comply with the standards adopted by the National Council on Compensation Insurance there should be at least two empty cars between the locomotive and the powder car and these cars should be connected to locomotive by insulated coupling.

RAILWAYS.

I entered "E" mine, Superior, accompanied by Asst. Supt. Hicks and Safety Supervisor Murray, thru the manway.

The immediate entrance to the mine is thru an old entry which has been reopened by the present mine management and made into a fairly respectable manway. There is a rather

steep pitch near the surface with two steps. The outer step is too high and the lower step has limited head room. In some places in this old entry the head room is limited and the width is restricted, but it is unobstructed, dry and safe.

At all the mines except Hanna #6, an improvement can be made at the portals of the manways if screens with covers were built in front of the openings. Men walking out and facing the glare of sunlight and snow are in danger of hitting their heads on timber or roof. Screens with coverings, if placed the right way in connection with prevalent direction of storms, will also prevent blocking of exits by snow drifts, and may also prevent floods from entering.

The manway inside "L" mine is in good condition but there are several places where it crosses rope roads, locomotive roads and partings. The trolley guards at some of these crossing points, as well as throughout the mine, are not adequate in my opinion. They are made of several thicknesses of brattice cloth, and although well put up, they would not prevent a man from putting his head between them and coming in contact with the trolley wire, nor would they prevent some tool from hitting the wire. I would suggest they be made of white pine and painted white. Objection has been made that wood will splinter-- but if made of soft white pine and maintained in the generally good condition the mine management keep equipment there would not be much danger. Would suggest experiments be made with ¼" "Celotex." This, if thoroughly painted, would not splinter and might prove serviceable, without undue expense.

There are several unused single doors along this manway more or less securely fastened open. On one which was found wired open there was a nicely painted sign warning to "keep this door closed." Upon calling the assistant superintendent's attention to it he tore it off.

The safest method to follow when doors are permanently abandoned is to take them off their hinges and out of the mine. If there is a possibility of future or emergency use they should be taken off their hinges and put in a convenient place near by with appropriate instructions painted on them.

In regards to manway crossing rope and locomotive roads and partings, this is bad practice and should be avoided if possible. At one place in this mine the manway is along part of the locomotive road which passes a motor generator set near a curve. Some men might not hear the approach of a motor trip due to the noise of the motor generator set. Signal gongs similar to those used on railroad crossings would make this crossing safer.

I am aware that "a man trip is run" but often men quit before the man trip and they must travel the manway. Also Company men going to different parts of the mine are required to keep off the haulage ways and use the manways so that in spite of the fact that "a man trip is run" many men travel the manways.

In non-gaseous mines not laid out with manways on both sides of haulage ways it is often possible to convert the return air course into a manway. By so doing there is great-er necessity for maintaining the main return airways in good condition thus improving ventilation and cutting down power expense. This would require easy grade approaches to overcasts, proper drainage at them, and double doors open-ing against the air and provided with self closing devices at all places where men enter or leave the aircourse. Double doors at least 15 feet apart should always be placed in any main aircourse where a door is needed.

When watching the men on the man trip I noticed some men who sat on the open end of the cars would put their feet on the couplings to brace themselves. As for most of the men on the car there is no brace or means to hold on I would suggest considering the advisability of putting a center railing or hand hold along the length of the car at the same height as the end railing. Care should always be taken to have man trip go around curves slowly as there is a tend-ency for the inside rope of yoke to main rope to drag and possibly catch in rollers, frogs and switches.

INSIDE POWER INSTALLATIONS & WIRING.

The installations of hoists, pumps, motor generator sets, transformers, etc., is of a high class. I have never seen uniformly better installations. The wiring also is splend-idly done. All give eloquent evidence of the intention of the management to reduce to a minimum the dangers of elect-ricity. This is true of all the mines examined and there are few suggestions to make on permanent installations.

The top motor-generator set of Superior "2" is heavily loaded and when inspected was found to be running rather too hot even though a small blower fan was used and the room had an outlet to the return air course through four 6" pipes. Later, when I inspected the main return air course, I found a galvanized iron pipe, 12" or 14" in diameter had been placed in the stopping and the blower fan had been stopped. This had greatly cooled the set so that it ran at normal temperatures. This meant, of course, that quite a noticeable quantity of fresh air had been taken from the fresh intake and shorted before going to

the working faces. It appears to be a practice of your company to place such sets in crosscuts and give them an offset a separate split of air. If these sets were placed a little differently it would be possible to conserve the air taken to cool them without polluting it or cause any undue fire hazard. It is possible to put these sets on intake air without shorting a portion of it by building steel doors that could quickly isolate the set and prevent fires from going inside. If the sets increase the temperature of the air current unduly it is evidence that they are loaded perhaps too heavily, but atomizer sprays could be placed on the return side of generators which would cool the air current and also saturate it with moisture so that it would not absorb moisture from parts of the mine inbye.

Would suggest gunniting the coal ribs of all machinery and transformer stations, switch panels, etc.

Would suggest lightning arresters on all power circuits entering the mines.

HAULAGE.

The tracks and haulage system in "I" mine, Superior, are typical of what prevails in all the mines visited so my remarks will apply to all, exceptions to be noted for each mine.

The extensive use of 20 and 25 pound rails is very noticeable, especially on motor roads. Quite a few of the panel slopes had 40 lb. rails which made the 25 lb. motor tracks seem the more incongruous.

Since it is the policy of the Company to go to the mechanical loading entirely, the track question is resolved to one largely of main haulage tracks and I believe that the use of heavier rails for locomotives will amply repay in economy and efficiency of operations and a reduction in accidents.

I noticed the almost entire lack of shelter holes on rope haulage roads and on some main locomotive roads, especially at switch stands, reliance being placed mainly on cross-cuts and entry turnouts. The National Council on Compensation Insurance require shelter holes on mechanical haulage roads and the slope sinking operations to be not exceeding 45 ft. apart, and to be at all doors and switch throws. On level entries the interval shall not exceed 90 ft. but it is permitted to consider room necks and cross-cuts as shelter holes. These shelter holes should not be less than 4 ft. wide, 2½ ft. deep and 3½ ft. high, and the bottom should not extend below level of track nor more than 1 ft. above. In mines such as Superior "G" with tender roof

requiring narrow entries this safety precaution is a good one.

A variety of switch throws was seen-- all the new ones being the parallel throw type which is good practice. With the old right angle throw type not enough room was left in many instances to allow proper safety-- often the end of the handle would almost touch the rib or a timber.

Again in a great many cases the switch throw is on the inside of the curve on rope haulage roads-- with no shelter holes. With or without shelter holes the switch stand should be on the outside of the curve.

On some of the partings, especially those in mines with steep pitches where the full height of coal bed is mined, the ends of the ties of the upper track are sticking up without any ballast between them and in one or two instances pipes cross partings from 6" to a foot above the floor. The two tracks were placed against the ribs as close as possible, leaving as the only passage way the space between tracks. As parting tenders and other men constantly use this passage way and often run to couple and uncouple cars it would be well to sink all pipes below floor and to box in the ends of the ties of the upper track with 2" plank and fill in ballast between ties.

Locomotive roads in level entries in coal 5 to 8 feet thick are laid as close to the low rib as possible, in some places making rib clearance on low side sub-standard. The clearance on the upper side was almost without exception more than standard requirements.

The placing of track close to low rib made the trolley wire come close to the rib so that there was little chance to come in contact with it. In low coal this is quite a safe guard. I believe, however, that standard clearance of 2 ft. from motor to rib should be maintained for safety of motor men.

In most of these low coal entries the track is inclined towards the low rib-- presumably to give more head room for trolley. To correct this to some extent some tracks had 30 or 40 lb. rail for the low rail, and 20 or 25 lb. rail on the high side. When locomotives run the same way continuously without reversing ends this arrangement causes unequal wear on ties. When there is a difference in elevation between rails, bearings on both cars and locomotives get unequal wear, and there is unequal traction.

In coal 6 to 8 ft. thick with moderate pitch there is not much excuse for this condition and it would pay to correct it on all new tracks at least.

In 5 ft. coal there is more excuse but for locomotive

runs which will last for considerable periods I believe it would pay to correct. The cutting machines generally leave some coal on the floor and the rock below the coal is not particularly hard so that it is possible to use a combination of steel and wood ties by sinking the wood ties at the upper end and making them long enough to butt against the low rib to maintain proper alignment. By ballasting the low side of track and using 30 to 40 lb. rail on both sides, a good track can be made with ditch against low rib which would add greatly to safety and economy.

Pushed trips are common practice. With light track, uneven elevation of rails, poor roof and much timbering this practice constitutes a serious menace to safety. Particularly is this true in entries with rolls, for the light (4 ton) locomotives are run at high speeds in order to handle the loads up grades.

Pushed trips are not good practice even on heavier tracks and should be discontinued for safety reasons. Economy would also be noted if trailing trips only were run, for the track resistance to pushed trips is from 2 to 6 times greater than for trailing trips.

I noticedit is the custom for rope riders to ride the hitchings between cars when loaded trips are pulled up. They ride the rope when lowering empty trips. The excuse given for riding between cars is that it is easier to hang on. This may be true at Winton and Hanna but at Superior the grades are not heavy and machine loaded cars do not prevent easy hand holds over the end of the car. There is more danger jumping on and off from between cars than in dropping off the rear end, and in case of wrecks the rope rider has a better chance when on the rear car. There were 7 accidents (one fatal) to rope riders in these mines during 1929. The four accidents in Winton seem to illustrate the point:

1 fatal--riding trip that derailed
1 derailed car caught foot
1 caught foot between cars
1 injured getting on trip.

Fuller information might prove my deductions wrong, but the brief descriptions I saw would indicate the danger of riding between cars. Rope riding is an occupation that should be dispensed with whenever trips can be pulled from a few partings close together. Many times the trips do not have red lights- or they were on the wrong end.

TIMBERING.

A good supply of timber was on hand in each mine visited and a fairly good system of timbering was carried out. The use of saddle jacks to aid timbermen and for temporary use

when cutting or loading with Eickhoffs is very commendable.

The small 2"x 6" or 8"x 20" sawed caps so much used throughout these mines seem inadequate and I believe should be replaced by longer caps with greater cross section dimensions. I believe 6"x 6"x 30" and 36" should be used.

In retimbering entries it is evidently the custom to place entirely new sets between broken sets. The old sets with broken cross-bars are generally left up but should be taken down. If the broken collars are left up to support loose material they give a false security as they may be easily dislodged and permit loose rock to fall. If the roof is so badly broken as to require support between collars lagging should be put in. Moreover, broken collars reduce clearance and are a source of head injuries because of their splintered and jagged breaks. If these sets are taken down it is often possible to re-use the legs and the broken collars can often be sawed into good caps. Or it may be possible to use saddle jacks to hold roof while replacing broken cross bars with new on the old posts.

Particularly in the Superior mines the miners should be continually instructed to set caps at right angles to roof slips which apparently run about parallel to the face of the rooms in these mines.

The roof in most of Superior "B" mine does not appear to be unduly treacherous or hard to handle but does require careful watching and systematic timbering.

I believe that in Superior "B" Mine a more earnest attempt to pull props in pillar workings make pillar work safer and effect considerable economy in timber. Many of the caves adjacent to pillars appeared to be only primary caves which do not relieve pressure on pillars to any great extent.

However, to facilitate the recovery of props and induce good caving, a systematic plan for bringing pillars back on a definite line would be necessary. At present an entry is pulled by itself and in order to justify haulage and other company men expense a large number of places must be kept working in each entry. This means a long pillar line approaching parallel to the entry, hence eventually there are a number of small stumps along the entry which have to take all the weight and are more dangerous and expensive to recover.

Would suggest two entries be pulled together along a pre-determined line extending from the top of the rooms of the upper entry to the back entry of the lower pair. Experience and the direction of the rooms will indicate the proper angle of this pillar line to the entries. The pillar line should be marked on all pillars, the same number to be marked on all pillars on the same line and the pillar boss made to keep pillars on line.

I am informed that foremen are required to carry roof testing sticks for sounding roof. They invariably used it and also made visible inspections. This is a good practice, but I am of the opinion that if working places are frequently visited by various bosses who are required to test roof it may have a tendency to cause face workers to depend too much on these inspections. One boss I noticed made the face workers test roof by sounding with picks. I believe this should be encouraged and that the face workers should be constantly instructed to test roof themselves and not wait for the boss to assume all responsibility for their safety.

POWDER & SHOOTING.

The handling of powder both inside and outside the mines was well taken care of with exceptions noted under separate mines. Shooting during working shifts is universal--an attempt being made to minimize it in the Hanna mines. In the other mines the shot firers, although carrying safety lamps, do not make any serious effort to examine for gas before or after shooting.

The use of the red detonator containers or cartridges has many advantages but I believe the empty containers should be taken out of the mine and destroyed. Perhaps some system of checking in and out can be devised that would not entail extra expense. When these containers are allowed to lay scattered around in the mine the miners are apt to become careless because they think they are all empty, for unless the container is broken after the detonator is taken out it is difficult to know if it is empty without picking it up for examination.

With mechanical loading, especially with Eickhoffs and scrapers, shooting during the shift is indespensable for economic success, hence it is necessary to take extra precautions. This means either more sprinkling or more rock dusting, closer inspection before and after shooting, and more attention paid to worked out areas. I noticed considerable machine cuttings that were none too wet and many places along conveyors where there were piles of fine coal dust as much as two feet high, the blower fans tend to keep the dust from shots in suspension and to carry it over a wider area than does an ordinary ventilation.

In gassy mines I am opposed to shooting during the shift. Bulletin R. I. 3028, U. S. B. M. Aug. 1930, gives some rather startling information regarding the initiation of coal dust explosions by gas explosions. On Sept. 11 an "exception" in the fire boss's report noted 50 cu. ft. of gas in a cave near the face of a room in Hanna #4 mine in which a conveyor was working. This was not a high room as

it was on developments, thus the gas could have easily been diffused into an explosive mixture by working operations. These caves may occur during working shifts-- hence the necessity for testing for gas before and after shooting.

ROCK DUSTING.

In none of the mines examined was found a uniform damp condition--some parts in each were dry with considerable accumulations of fine coal and dust.

Quite extensive use of rock dust was in evidence but in practically all mines rock dusting should be renewed. The rock dust in many of the barriers was damp, at least on top, and will have to be renewed. The covers to troughs recommended by U. S. B. M. to prevent too rapid spilling of dust are of questionable value to my mind for if the dust is damp the spillage would be none too great in any event. It seems to me it would be preferable to have some troughs balanced so as to discharge easily and others to discharge later under heavier blasts. Wood troughs rot quickly and hold moisture which is absorbed by the rock dust-- there is also more or less fire hazard connected with them. Would suggest the galvanized iron trough invented by F. A. Sweet of Salt Lake City as worthy of investigation. I understand the M. S. A. Co. is investigating them. Altho first cost may be heavy they have the advantage of permanence, carrying capacity, cheap and quick to install, ease of setting and changing and requiring less entry space. Moreover they don't absorb moisture.

Altho a firm believer in rock dusting I do not believe it will serve the purpose expected of it if it is only applied to roof and ribs of active working entries-- It must be used more universally close to working faces, with each section barricaded to localize explosions. Suggest considering placing portable dust shelves on the timbering near working faces in addition to dusting the places. The period-- January to March, inclusive, is the most critical from explosion standpoint. Coal dust accumulations from heavy fall and winter campaign, the drying of mine by cold ventilating currents coupled with marked barometric changes call for added rock dusting.

MECHANICAL LOADING.

I admire very much the mechanical mining operations of your company. It shows much careful study. In regards safety in its application I would suggest more attention be given to the care of coal dust. The scrapers are the worst offenders in this regard and I can suggest nothing but sprinkling before shooting as cleaning operations appear to be out of the question until the scraper is taken out. Then as much as possible of the fine coal should be loaded out. Along many of the conveyors there are accumulations of coal and fine dust caused by spillage and leakage of pans. As mentioned before some of these dust piles are large and should not be allowed to accumulate. Cleaning up after a place is finished should be done after all machines.

Often at the car loading stations the power wires for machines are found piled up on the floor in indiscriminate manner. In several instances I saw bare places in the cables which had been partially taped. In other places cables passed under tracks without having pipe conduits to protect them. Suggest some means be employed to keep cables coiled and that no "rough and ready" splices be allowed.

As necessity requires would suggest the replacement of old open motors with gas and dust proof motors and for Kenna mines permissible equipment throughout.

There is some disposition to keep timbering a little too far back from the face in mechanical loading places. The noise of these operations makes roof testing by sounding rather difficult, hence it is a good plan every once in a while to "stop, look and listen."

I would also suggest careful trimming of ribs and faces so as to keep the top near the roof inclined away from the room.

There is a tendency towards sloppiness in many of the conveyor installations. Too much loose coal and tools, material and wire scattered around.

VENTILATION & FANS.

All main outside fans were found in good condition, generally with fire proof housings. Fan for #2 mine at Superior had motor room encased in not strictly fire proof structure, as was also G Plane fan, Hamm #4. The electrical work, as usual, was good but not all fans had lightning arrestors and none had signals which would warn officials that fan had stopped. Some states require this signal and in addition require that whenever the fan has stopped power must be shut off from the mine. Some states also require auxiliary drives for emergencies for gassy mines. Would suggest stoppage signals for all fans and lightning arrestors for all electrically driven fans.

The air locks of the new Vulcan fans at Superior are rather small and the double fastenings of the doors make them hard to get in and out.

For fans having reversing gates that work vertically suggest having a tripod kept handy, equipped with pulley, rope and drop weight. At two Utah explosions these gates were blown and jammed open and required some time to close. Some men were gassed in the attempt at one mine and at the other the work was delayed until men with oxygen breathing apparatus could be brought up.

I do not think it good practice to have fans located any considerable distance from outside operations. The fans for B and C mines at Superior and for #3 mine at Winton, especially the two latter fans, would be difficult to get to in bad weather with snow on the ground, and cannot have the frequent inspections all fans should have.

Generally the mines have two means of exit besides the fan, but no stairways are provided in the air shafts. To do this would require spiral stairways of non-corrosive metal and grid steps which may be an unnecessary refinement.

The extensive use of blower fans requires careful handling. In a strictly technical sense many of the fans are operating on return air which in gassy mines is not good practice, especially with open type motors. I cannot see that there is any undue hazard in mines giving off no gas if fans are properly used. Your rules are specific and if followed should minimize the dangers. However, I suggest constant inspection for gas, even in mines where "no gas has ever been found" as there is no assurance that it never will be found.

Quite a few instances were seen of poor support to tubing, with leaks and kinks which partially nullified the benefits of air at the faces. The fuses at fans should be inspected every day as there is a temptation to replace burnt out fuses with wire if waiting for the electrician would cause delay.

The air in practically all the working places was good, and ventilation seemed adequate throughout.

Too much reliance should not be placed on the fact that "gas has never been found." It would seem strange that, with the Baxter Basin gas field not so very far away, gas at some time might not be found in the Superior and possibly Minton mines. I believe the men carrying safety lamps should use them for testing and not merely as a badge of office. They would at least indicate the presence of CO-2 from adjacent old workings which the miners-- with their electric cap lamps, cannot now detect except by its effect on them.

I travelled the main return air courses of all the mines and found them generally in very fair condition for such entries which, as a rule, are usually neglected. In the flatter bed mines these main returns could be kept in better condition if light track was maintained in them. Exceptions noted under separate mines.

INSIDE STABLES.

Stables were found in good condition with small quantities of hay in fire proof compartments, ventilation on separate split returning to main return. Transportation of hay in covered cars, good.

The stables look a little narrow for such splendid large animals. The stable in E mine, Superior could be improved if the partitions between stalls were built of reinforced concrete for 3 or 4 ft. up and the pipes forming the partitions above the concrete were spaced about 9 inches centers and continued up higher-- at least, it would prevent an animal from putting his feet on his neighbor's back and stealing his food. The new stable being built in Mamm #4 is on these lines. The hay room in stable in D mine at Superior has a frame door which should be replaced by steel or lined with steel.

I believe an added safeguard would be to gunnite all coal ribs in the stables.

OLD WORKINGS.

In going through the mines and studying the maps I have been impressed with the large areas of worked out and partially worked out unsealed old workings and the many "dead ends" all over the mines. Further I noticed many open workings with pillars which contained large quantities of coal dust.

Old open workings with accumulations of dust and possible accumulations of gas are a serious menace to any mine, no matter how well the active workings are taken care of.

In my opinion it would be safer to seal as many of these areas as possible as it is impossible to adequately rock dust or water them, and many such cannot be inspected.

Areas that must be kept open for one reason or another should be cleaned and rock dusted if possible, before abandoning, but if not, many of them could be fairly well protected by rock dust barriers.

When rooms and entries have reached their destination, or have to be stopped, cross-cuts should always be driven to connect faces so as to prevent any dead ends where gas might accumulate. This is a good rule even in non-gassy mines.

Mines, especially those whose coal is subject to spontaneous combustion, should be so laid out that comparatively small areas can be sealed with a minimum number of stoppings and all such stoppings should be on a separate air return to the fan, distinct from manways, and free from all power lines, sufficient air can be passed along these sealed areas to take away the gasses that will bleed from them, but men other than fire bosses, inspectors, etc., should be kept out.

I am conscious that many of these conditions are the result of operations of many years ago, but an inspection must treat of conditions "as is."